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Secret

AIR INDUCTION SYSTEM

Description and Maintenance Instructions

M641-A76-247

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The book contains 15 pages.

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I. DESCRIPTIONA. PURPOSE AND BASIC SPECIFICATIONSPurpose

The air induction system is designed to provide air to the submarine in the surface condition for operation of the diesels, diesel-compressors and for the ship ventilation system.

The starboard pipe line up to the main air induction out-board flap is also used in the snorkel air induction system.

Basic Specifications

1. The inner diameter of the ventilation stack inside the fairwater (equivalent) 780 mm
2. Inner diameter of pipe lines 550 mm
3. Permissible air rarefaction in compartment 200 mm H₂O
4. Pipe material steel
5. Gasket material paronite.

B. GENERAL DESCRIPTION AND DESCRIPTION OF INDIVIDUAL UNITSGeneral Description

(Figs 1 - 8, 11)

The air induction system consists of two pipe lines, laid one on port and the other on starboard sides. Both pipe lines are used for the simultaneous operation of two and three diesels. Any diesel can operate either from port or starboard pipe lines.

Air to the engine room is supplied through a recess in the fairwater (which is divided into two isolated stacks) and then to starboard through flap 10, watertight pipe line 11, inboard valve 10, starboard stack 19 and to port from the induction stack to port line 7, flap 3, watertight pipe 2, inboard valve 1 and stack 15.

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The starboard stack is connected with the ventilation supply line while the port stack is connected with the ventilation exhaust line.

When the ventilation supply system and the air induction system are used simultaneously, the amount of air supplied from the ventilation stack directly to the compartment and to the ventilation supply line is regulated by throttle valve 20 mounted in starboard stack 19.

The regulation is considered over when the minimum difference in the air rarefaction between the compartments is obtained by adjusting the position of the throttle valve disc.

Used air from the compartments flows through the ventilation exhaust pipe line to the port stack and then through open throttle valve 23 to the engine room where it is sucked by the diesels.

When the diesels are stopped, the throttle valves both in the port and starboard stacks are closed and air from the starboard stack is supplied only to the ventilation supply line and the ventilation exhaust line is used to discharge used air to the port stack and further through the pipe line to the atmosphere (See Ship's Ventilation Supply and Exhaust Systems Description and Maintenance Instructions).

Flap 10 is the first lock in the line; it is actuated by hydraulic mechanism 5 through drive 13. The control diagram of the flap is shown in Fig.3. The hydraulic mechanism is controlled by control valve 35 mounted in the engine room (See Fig.6).

When necessary, the hydraulic mechanism may be actuated manually by means of a ratchet wrench (See Fig.5) fitted on its crankshaft.

To reduce the effort applied to the ratchet wrench to close the flap, drive 13 is provided with spring 79 (See Fig.11).

To avoid knocks, the time necessary to open and close the flap by means of the hydraulic mechanism should be about 2-3 sec.

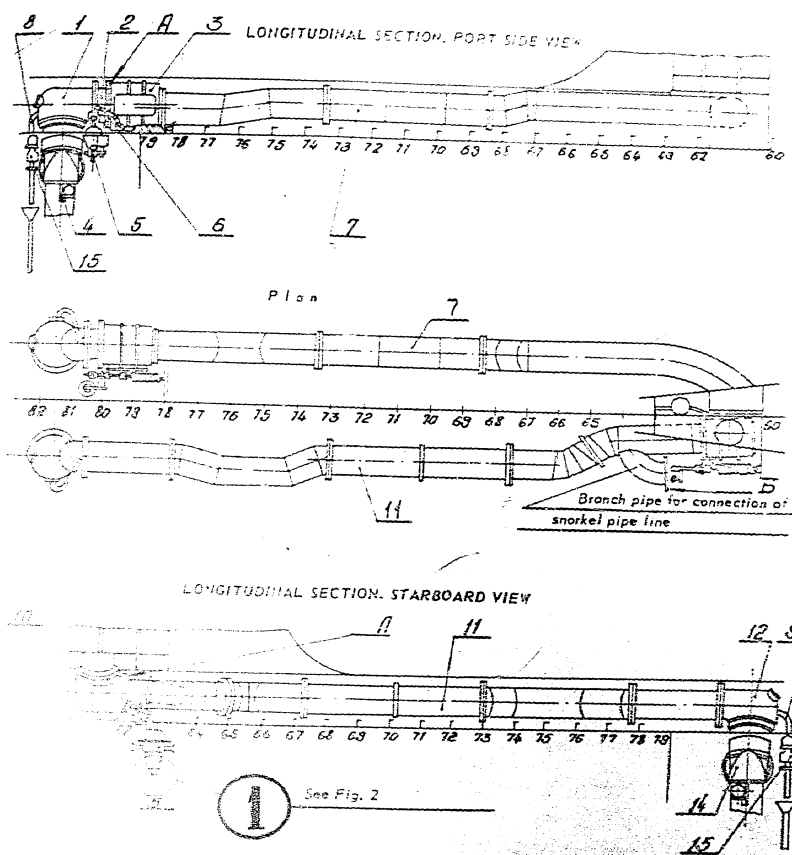
The position of the flap is determined by letters "O" (Open) and "Z" (Closed) on the cam of the hydraulic mechanism and by light signals in the control room and on the control panel in the engine room. With the flap closed a green lamp lights up, and when the flap is open, a milky-white lamp lights up.

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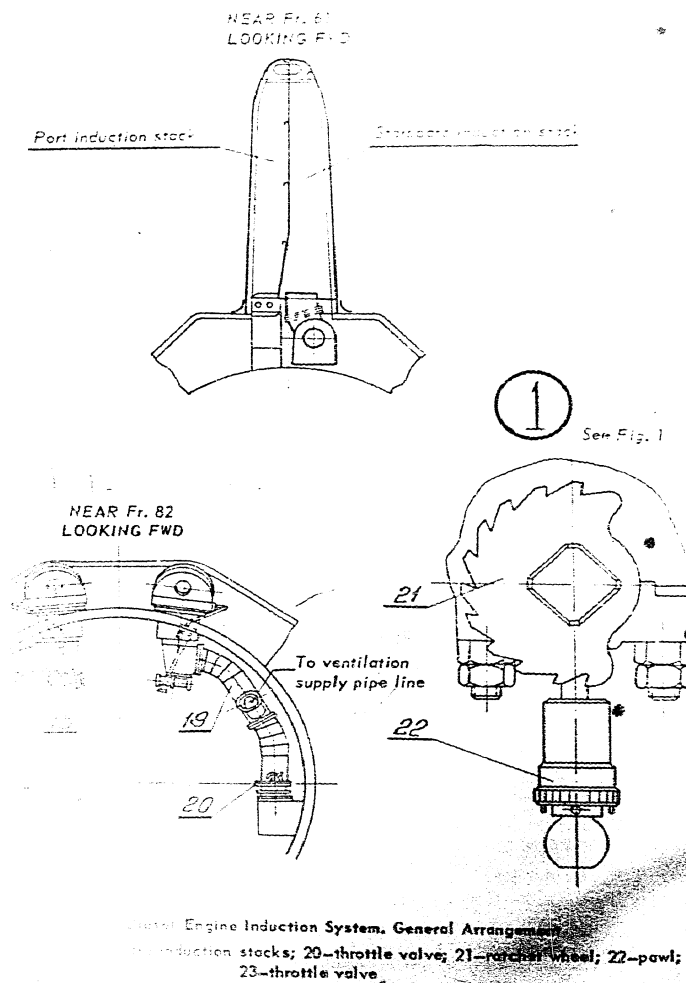


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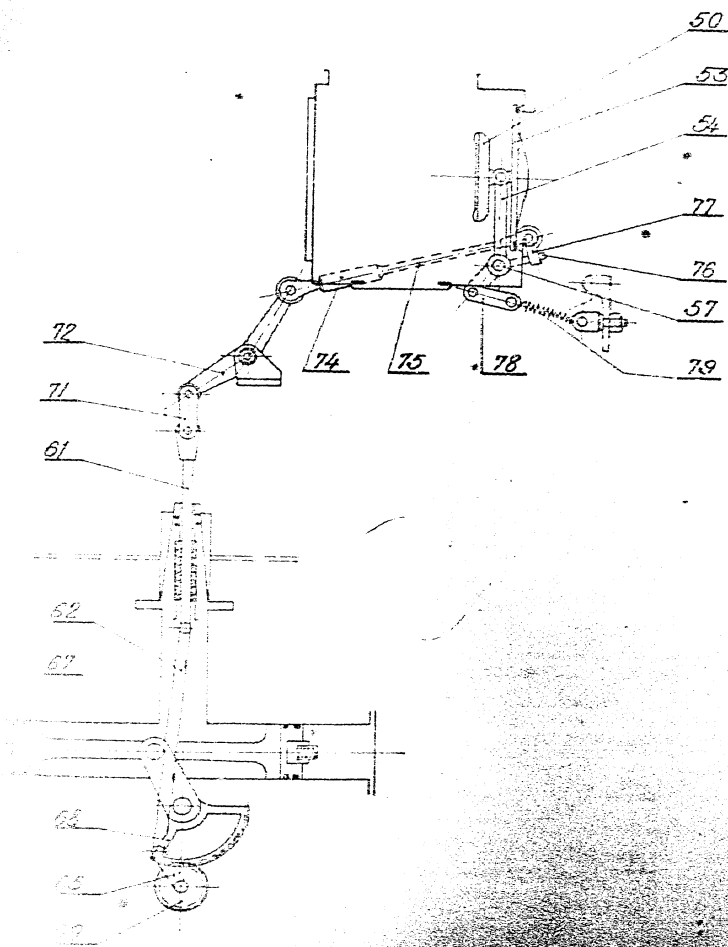


Fig. 3. Outboard Flap Control System

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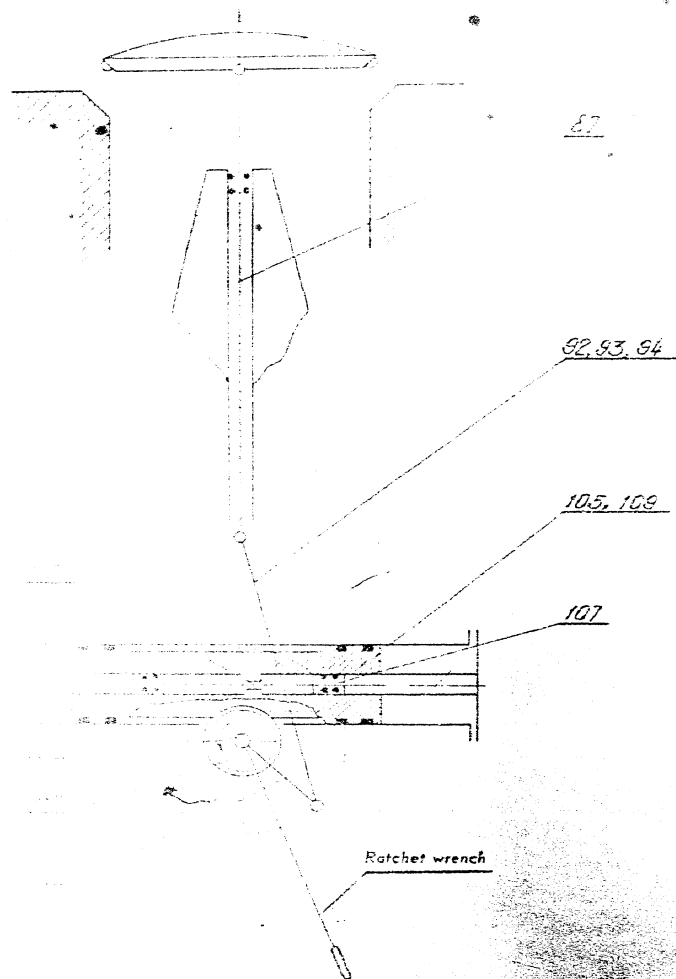


Fig. 4. Inboard Valve Control Diagram

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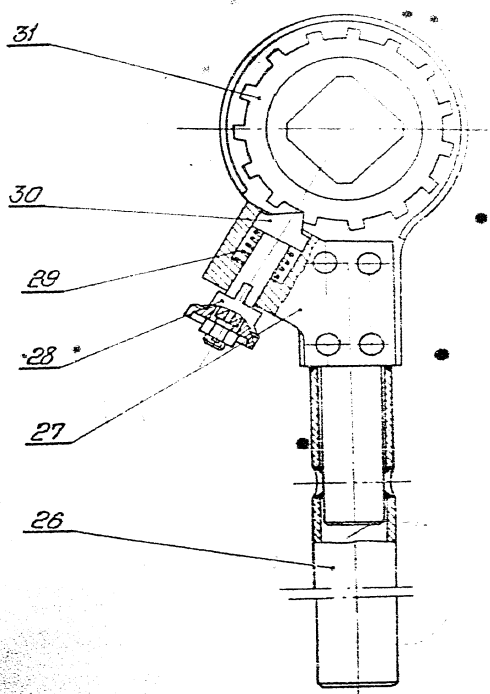


Fig. 5. Ratchet Wrench
26—pipe; 27—handle base; 28—button; 29—spring;
30—pawl; 31—ratchet wheel

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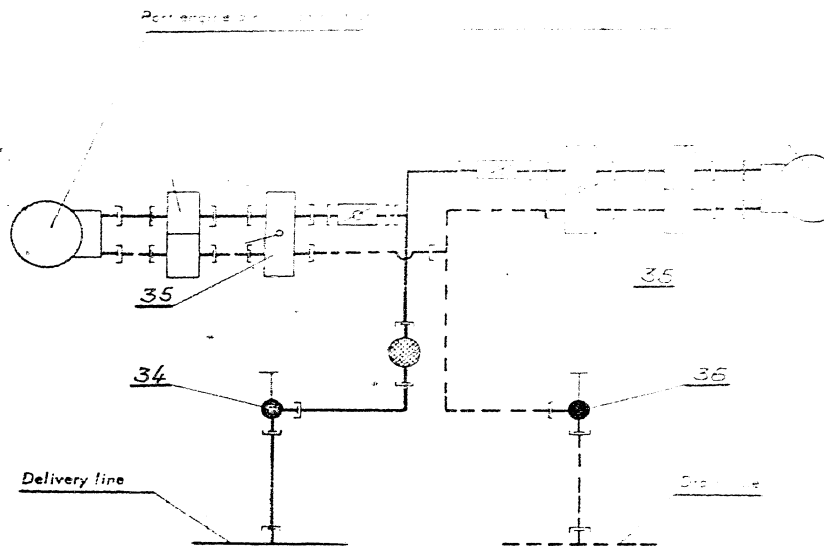
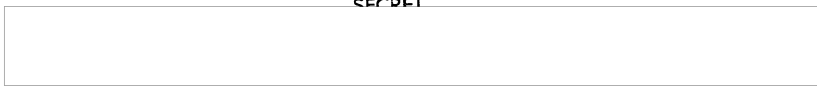
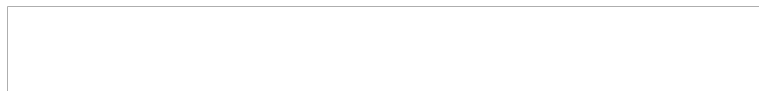


Fig. 6. Control of Air Induction Flap Hydraulic Mechanisms, Schematic Diagram

Ballcock valve	○
Check valve	⌞
Drainage valve	⌞
Throttle valve	⌞
Angle stop valve	●
Branch pipe union on pipe	⌞
Threaded connection with union nut	⌞
Description	Symbol

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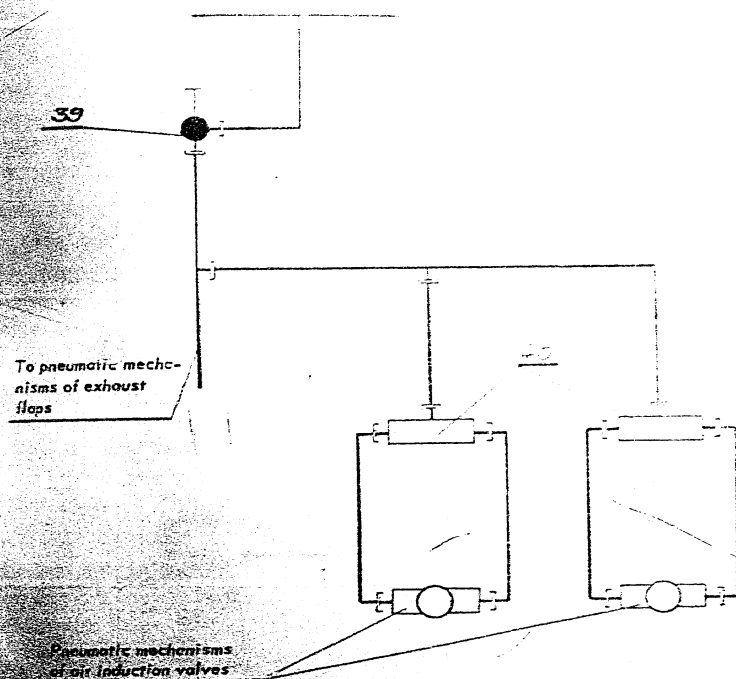


Fig. 7. Control of Air Pipe Line Induction Valves. Schematic Diagram

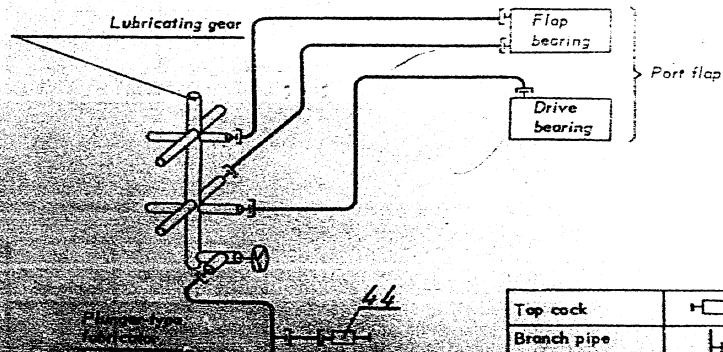
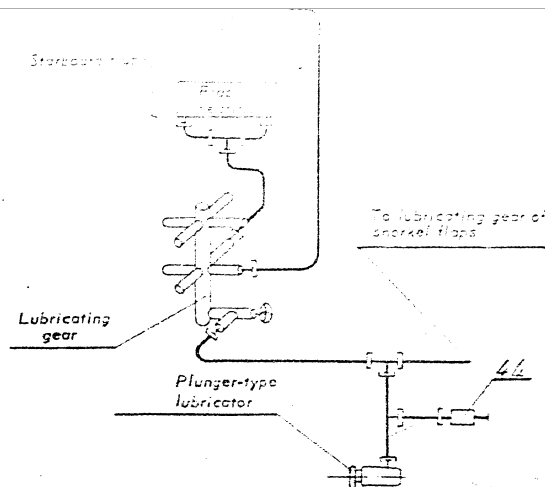
Control valve	
Angle shut-off valve with manual drive	
Branch pipe union on pipe	
Enclosed connection with union	
Designation	Symbol

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Top cock	
Branch pipe union on pipe	
T-piece	
Threaded connection with union nut	
Description	Symbol

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Inboard valve 50 is controlled by the pneumatic mechanism.

The control valve 50 is controlled by the pneumatic mechanism.

The pneumatic mechanism is controlled by control valve 40 mounted in the engine room (See Fig. 7).

To avoid knocks, the time necessary to open and close the valve should be equal to 1-2 sec. It is adjusted by placing throttle washers into the pipe unions mounted on the cylinder covers of the pneumatic mechanism.

Air to the pneumatic mechanism is supplied from the diesel starting air line (Fig. 7).

The air pipe line is made of steel and tested after assembly with a pressure of 35 kgf/cm².

When necessary, the valve can be controlled by a ratchet wrench fitted on the shaft of the pneumatic mechanism.

The position of the valve is determined by letters "O" (Open) and "3" (Closed) inscribed on the cam of the pneumatic mechanism and by light signals in the control room and on the control panel in the engine room. When the valve is closed, a green lamp lights up and when the valve is open, a milky-white lamp lights up.

Watertight pipe lines 2 and 11 are designed for a pressure of 45 kgf/cm² and are tested aboard ship for tightness with a pressure of 38 kgf/cm².

Pipe line 7 is light and is filled with water through the horizontal coaming of the flap when the submarine dives.

The tightness of the first locks is checked by means of drain pipe line 9.

The bearings of the flaps and drives are lubricated with grease (Fig. 8).

The lubrication pipe line is made of copper in the superstructure and of steel in the pressure hull.

Description of Individual Units

Air Induction Flap (Fig. 9)

Shaft 57 carrying lever 54 with two discs 50 and 53 is turned by the hydraulic mechanism through the drive.

The vertical coaming is made airtight with disc 53 and the horizontal one - with disc 50.

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To avoid binding of the lever, a roller is provided in the coamings, the lever is provided with a roller.

The coamings are made airtight by means of rubber rings 49 and 52 secured with pressure rings 48 and 51.

The rubber rings are replaced without going through a hatch with cover 47.

The flap body, discs and lever are made of steel.

The discs and coamings are provided with stainless steel bosses. The shaft is also made of stainless steel and its bearing bushes are made of bronze.

The assembled flap is tested for airtightness in the direction shown with arrow B with a pressure of 38 kgf/cm² and the horizontal coaming is tested by flooding with water.

The port flap is similar in design except for the location of the hatch and air intake pipe.

Hydraulic Mechanism

(Fig. 10)

For the description of the hydraulic mechanism see "Diesel Engine and Diesel-Compressor Exhaust Line. Description and Maintenance Instructions".

Exhaust Line Flap Drive

The clamps 81 mounted in rods 75 compensate for possible misalignment. The tightness of flap coamings 3 and 10 is adjusted by means of turnbuckle 74 and by changing the length of rods 75 due to the displacement of clamp 77.

To protect the threaded part against corrosion, turnbuckle 74 is coated with anti-rust cloth 73 and the space between the turnbuckle and the rods is lubricated with grease, grade AMC-1.

Pneumatic Mechanism

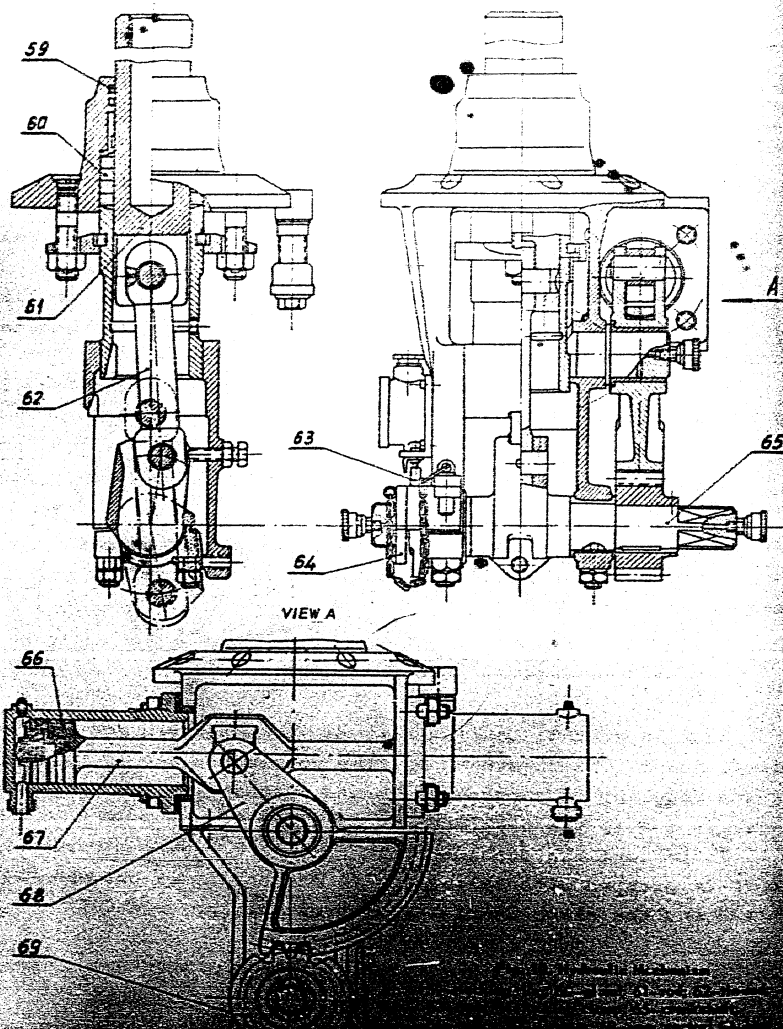
The pneumatic mechanism 96 is a part of the diesel engine. The valve components are 97 and 98.

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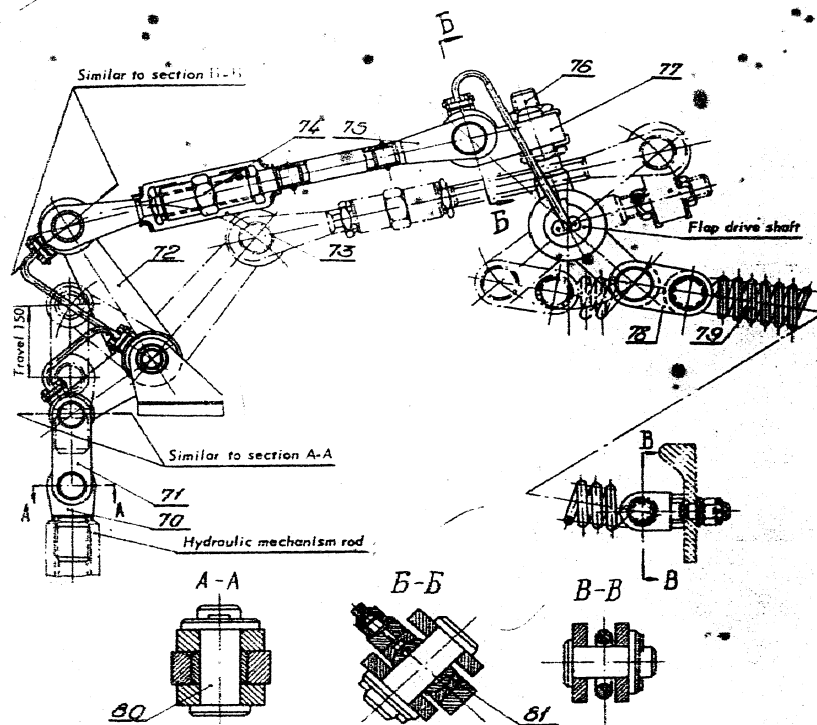


Fig. 11. Air Pipe Line Flap Drive

70-eye-bolt; 71-link; 72-lever; 73-sail cloth; 74-turnbuckle coupling;
 75-tie-rod; 76-lever; 77-clamp; 78-link; 79-spring; 80-axle; 81-ball insert

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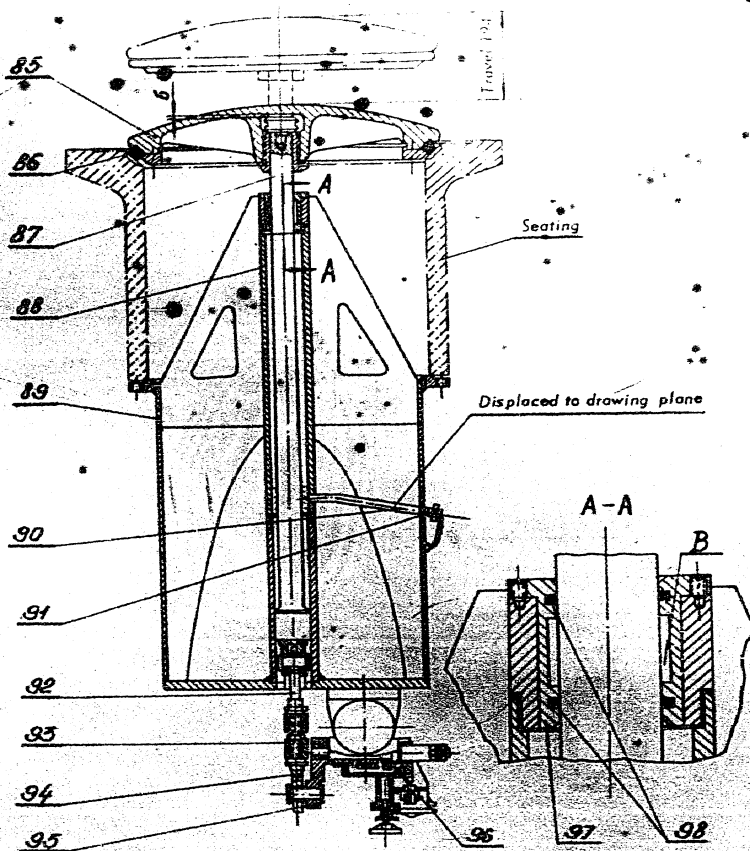


Fig. 12. Inboard Valve

85-disc; 86-packing ring; 87-rod; 88-pipe; 89-body; 90-pipe; 91-cap;
 92-link; 93-turnbuckle; 94-link; 95-crank; 96-pneumatic mechanism;
 97-bush; 98-packing ring

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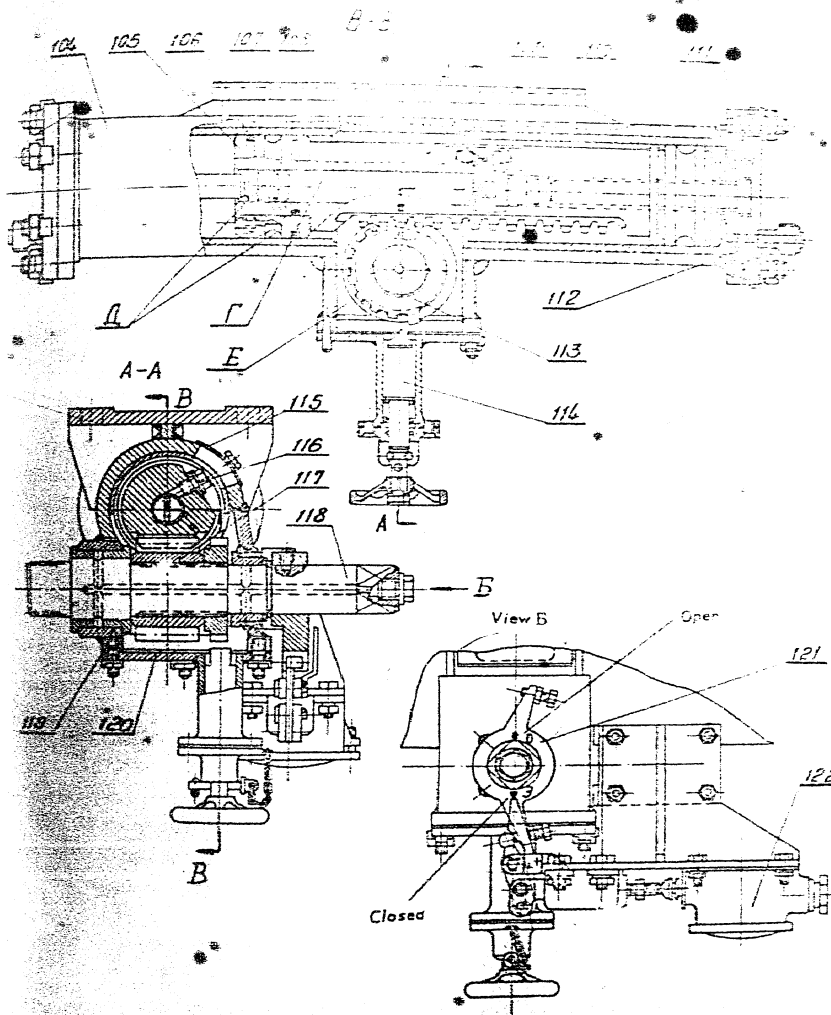


Fig. 13. Pneumatic Mechanism

104-body; 105-piston; 106-packing ring; 107-cataract piston; 108-packing ring; 109-rock; 110-nozzle valve; 111-cover; 112-packing ring; 113-ratchet wheel; 114-stop; 115-cover; 116-stop; 117-gear; 118-shaft; 119-gasket; 120-cover; 121-com; 122-alarm system connector

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As soon as air is supplied to one of the cylinders of the pneumatic mechanism, piston 105 together with rack 109 is moved upwards turning gear 117 mounted on one shaft with crank 95.

Crank 95 imparts rectilinear movement through the tie-rod comprising two links 92 and 94 and turnbuckle 93 to rod 87 with disc 85 provided with packing ring 86, thus opening or closing the valve.

To eliminate air cushion in pipe 88 while opening the valve, its rod is provided with a bore hole.

To avoid sharp knocks especially while closing the valve provision is made in the pneumatic mechanism for a damper in the form of an oil cataract. When piston 107 is displaced, the oil flows through throttle valve 110, thus ensuring smooth fitting of the disc.

Manually the valve is opened and closed by means of a ratchet wrench fitted on hydraulic mechanism shaft 118. To prevent the valve from moving in the reverse direction under its weight while opening, provision is made for a locking device comprising ratchet wheel 113 and stop 114.

CAUTION! To ensure normal closing of the valve, stop 114 should be always disengaged from ratchet wheel 113.

The open and closed positions of the valve are fixed by crank 95 overstepping the dead centers by up to 2° . The disc travel is about 194 mm.

The tightness of packing ring 86 in the closed position is adjusted by turnbuckle 93.

During assembly of the valve the circular groove in bush 97, the bearings in links 92 and 94 and pipe 88 are packed with grease, grade AMC-1. In order not to obstruct the hole in the rod designed to eliminate the air cushion the volume of grease occupied pipe 88 should not exceed 300 cm^3 .

During service the above-mentioned parts are lubricated by means of a grease fitting installed instead of cap 91.

Valve body 89, disc 85, links 92 and 94, turnbuckle 93 and crank 95 are made of steel. Bush 97 and ball inserts for links are made of bronze. Rod 87 is made of stainless steel. The assembled valve is tested for tightness on the side of the cavity above the valve with a hydraulic pressure of 38 kgf/cm^2 .

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Control Valve
(Fig.1-)

The control valve is hand-operated. When the handle of control valve 125 is turned to the OPEN (OPENING) or CLOSED (CLOSING) positions, the through hole in slide valve 123 coincides with the boring in control valve head 127 and connects the air-intake channel in body 126 with the respective cylinder of the hydraulic mechanism through a pipe line. At the same time air from the hydraulic mechanism gets into the boring in control valve head 127 connected with the vent hole in the head of the control valve through an arc-shaped groove in slide valve 129.

C. MEASURING INSTRUMENTS AND ALARM SYSTEM

No. of schematic diagrams	Purpose, name and type of instrument (set)	Transmitter type	Location of indicator and name of panel	Remarks
	Extreme position of outboard flap, port side (lock I)	3CC	Control station in compartment V and control room. Alarm panels	When flaps are open, milky-white lamps light up
	Extreme position of hull flap valve, starboard (lock I)	3CC		When flaps are closed, green lamps light up
	Extreme position of inboard valve, port side (lock II)	3CC	Control station in compartment V and control room. Alarm panels	When flaps are open, milky-white lamps light up
	Extreme position of inboard valve, starboard (lock II)	3CC		When flaps are closed, green lamps light up

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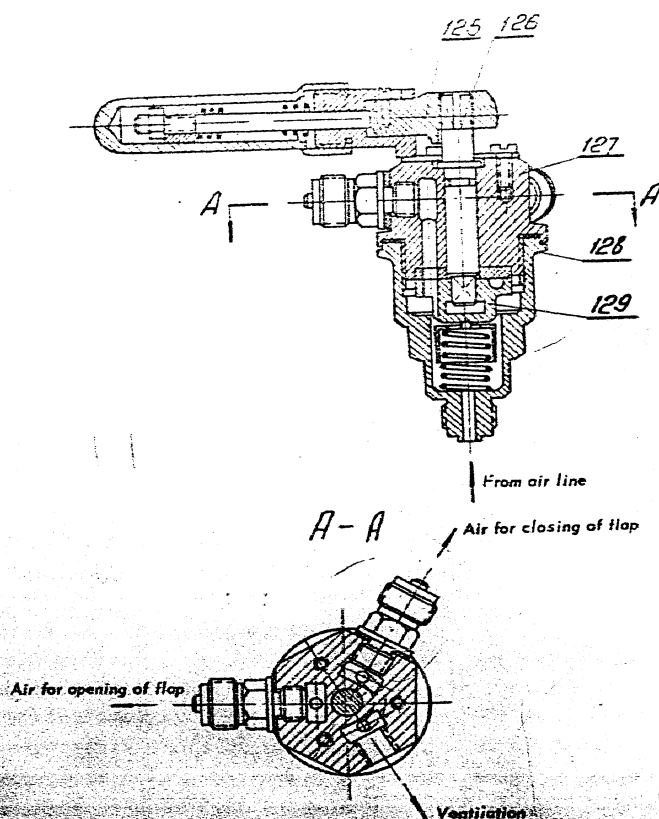


Fig. 14. Control Valve

125—handle; 126—head; 127—control valve head; 128—control valve body;
129—slide valve

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II. MAINTENANCE INSTRUCTIONSA. PREPARATION FOR USEChecking of Hull Locks Each Time Before Putting to Sea

1. While checking the submarine for tightness, check the tightness of outboard flaps 3 and 10 and inboard induction valves 4 and 14. To do so, proceed as follows:

- a) open inboard valves 4 or 14 and drain valves 15 and make sure that flaps 3 or 10 are airtight;
- b) close inboard valves 4 or 14 and drain valves 15, open flaps 3 or 10 and make sure that inboard valves 4 or 14 are airtight.

CAUTION! The flaps are considered airtight if the pressure variations are within the limits specified for the tightness test of the submarine.

2. Lubricate all the friction parts of flaps 3 and 10, drives 6 and 13, hydraulic and pneumatic mechanisms 5 and 96, respectively, and rods 87 of inboard induction valves 4 and 14.

3. Make sure that drives 5 and 13 operate normally at the oil pressure in the hydraulic system equal to 72 kgf/cm^2 for which purpose operate control valve 35 to open and close the flaps. At the same time check the readings of the mechanical indicators: the indicator pointer should be against "0" mark in the OPEN position and against "1" in the CLOSED position.

Check the functioning of the drives during operation of the pumps when the hydraulic system accumulators are disconnected. See to it that the control valves are in the OPEN or CLOSED positions depending on the check.

In case of malfunctioning of the drives at the pressure of 72 kgf/cm^2 find the cause and eliminate the trouble. The operation time of the flaps is 2 - 3 seconds.

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4. Check the operation of the alarm system against the readings of the mechanical indicators by slowly closing flap 3 and 10 manually.

If the alarm system functions properly, the green pilot lamps should light up as soon as the crankshaft of the hydraulic mechanism oversteps the lower dead center and the milky-white lamps should light up when the crankshaft is 2° before the upper dead center.

In case of malfunctioning of the alarm system, adjust it as directed in the "Description and Maintenance Instructions of Alarm System".

5. Make sure that the inboard induction valves and their pneumatic mechanisms 4 and 14 operate normally for which purpose use control valve 40 to open and close the inboard valves. At the same time check the readings of the indicators: the indicator pointer should be against the "0" mark in the OPEN position and against the "3" mark in the CLOSED position. The operation time of the valve is 3 - 4 seconds. In case of malfunctioning of the valves find the cause and eliminate the trouble.

6. Check the alarm system operation against the readings of the indicators of the pneumatic mechanisms by slowly closing and opening valves 4 and 14 manually.

If the pneumatic mechanisms function properly, the green pilot lamps should light up as soon as the indicator pointer reaches mark "3" and the milky-white lamps should light up when the indicator pointer is against mark "0".

In case of malfunctioning of the alarm system, adjust it as directed in the "Description and Maintenance Instructions for Alarm System".

7. Inboard valves 4 and 14

7.1. Check the operation of inboard valves 4 and 14 (See Fig.1) and their pneumatic mechanisms (See Fig.2) manually.

7.2. Check the operation of inboard valves 20 and 23 (See Fig.2) manually.

7.3. Check the operation of inboard valves 20 and 23 manually.

7.4. Check the operation of inboard valves 20 and 23 manually.

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11. Hydraulic control valves 31 (See Fig.5) are in the middle position.
12. Stop 114 is disengaged from ratchet wheel 113 (See Fig.13).
13. Air pipe line control valves 40 (See Fig.7) are in the CLOSED position.

B. OPENING THE AIR INDUCTION SYSTEM, ATTENDANCE DURING FUNCTIONING AND CLOSING THE SYSTEM

Opening the Air Induction System

For Diesel Engine Operation on Surface

Note: The succession of the operations listed below refers only to one side of the ship but it is also true for the other.

14. Open the valve disconnecting the starting air expander from the high-pressure pipe line and check the opening of the valve after the expander (See instructions for starting air system, ref. numbers 72 and 78).
15. Open air pipe line valve 39.
16. Make sure that the by-pass slide valve is in the HYDRAULICS (ГМНПАВЛМКА) position (See Fig.6).
17. Disengage locking clamp 64 from the hydraulic mechanism (See Fig.10).
18. Check to see if pawl 22 is disengaged from ratchet wheel 21 (Fig.2).
19. Check to see that stop 114 is disengaged from ratchet wheel 113 (Fig.13).
20. Make sure that valve 15 is open and no water flows from it (Fig.1). If the valve fittings are in good order, water will not flow through the valve.
21. Check if throttle valve 20 is open (See Fig.2).
22. Open onboard valve 14 by turning the handle of control valve 10 to position OPEN. See if the milky-white lamp lights up on the alarm panel in compartment V.
23. If the lamp fails to light up, check the position of the indicator of the pneumatic mechanism.
24. If the valve is open, eliminate defects in the alarm sys-

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b) If the valve is closed, open it manually. To do so, proceed as follows:

- 1) close air pipe line valve 32;
- 2) turn the handle of control valve 35 to the CLOSED position to relieve the pressure from the pneumatic mechanism cavity and then return the handle to the OPEN position;
- 3) make stop 114 get engaged with ratchet wheel 113;
- 4) fit the ratchet wrench on shaft 116 (See Fig.13) of the pneumatic mechanism and open valve 14;
- 5) remove the ratchet wrench and put it in its due place;
- 6) make stop 114 disengage from ratchet wheel 113;
- 7) find the causes of the troubles, eliminate the latter.

24. Open outboard flap 10 by turning the handle of control valve 35 to the OPEN position. Make sure that the valve is open by watching the lamps on the alarm panel in compartment V (the milky-white lamp should light up).

25. If the lamp fails to light up, check the position of the flap by the indicator of the hydraulic mechanism.

a) If the flap is open, eliminate defects in the alarm system.

b) If the flap is closed, open it manually. To do so, proceed as follows:

- 1) turn the slide valve cock to the BY-PASS (BEPETVOK) position;
- 2) fit the ratchet wrench on the shaft of the hydraulic mechanism, and open flap 10;
- 3) remove the ratchet wrench and put it in due place;
- 4) throw the slide valve cock to the HYDRAULICS position;
- 5) find the causes of the troubles and eliminate the latter.

CAUTION: Do not use the ratchet wrench on the slide valve cock in the BY-PASS position.

When the ventilation stack is closed, the air is supplied through the air pipe line. The air pipe line is described in the instructions.

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In this case the following modes of operation are ensured:

a) Operation of two side diesel engines at a speed of 490 r.p.m. according to the shafting tachometer for charging the storage battery and for power supply of the center shaft electric motor to ensure slow speed of the submarine;

b) Operation of two diesel engines at a speed of ca. 305 r.p.m. ensuring the running speed of the submarine about 8 knots.

The air pressure in the compartment will be not less than 700 mm Hg (rarefaction equal to 650 mm H₂O).

For Diesel Engine Shorkeling

27. Perform operations as described under Items 14, 15, 19, 20 and 21.

28. At the moment determined by the maintenance instructions of the snorkel system, open inboard induction valve 14 as specified under Item 22.

For Air Supply To Ship's Ventilation Supply and Exhaust Systems During Diesel Engine Operation

29. Set throttle valve 20 in the starboard stack in the position corresponding to the minimum pressure difference between the compartments for the given mode of ventilation and diesel engine operation.

30. Perform necessary operations in the ventilation system (See "Description and Maintenance Instructions for Ship's Ventilation Supply and Exhaust Systems").

For Air Supply to Ship's Ventilation Supply and Exhaust Systems With Diesel Engine Stopped

31. Perform operations under Items 14 through 25.

32. Close throttle valves 20 and 23 in the port and star-

board stacks and perform necessary operations in the ventilation system (See "Description and Maintenance Instructions for Ship's Ventilation Supply and Exhaust Systems").

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Closing the Air Induction System

34. Close outboard flap 10 by turning the handle of control valve 35 to the CLOSED position. Make sure that the flap is closed by watching the green lamp on the alarm panel in compartment V (the lamp should light up).

35. If the flap is closed, set the handle of control valve 35 in the middle position.

36. If the green lamp fails to light up, check the position of the flap by the indicator of the hydraulic mechanism.

a) If the flap is closed, eliminate defects in the alarm system.

b) If the flap is open, close it manually. To do so, proceed as follows:

- 1) throw the slide valve to the BY-PASS position;
- 2) make pawl 22 get engaged with ratchet wheel 21;
- 3) fit the ratchet wrench on the shaft of the hydraulic mechanism and close the flap;
- 4) remove the ratchet wrench and put it in due place;
- 5) set the slide valve in the HYDRAULICS position;
- 6) make pawl 22 disengage from ratchet wheel 21.

CAUTION! Do not use the ratchet wrench unless the slide valve is in the BY-PASS position.

37. Close inboard valve 14 by turning the handle of the control valve to the CLOSED position. Make sure that the valve is closed by observing the alarm panel in compartment V where a green lamp should light up.

38. If the green lamp fails to light up, check the position of the valve by indicator cam 121 of the pneumatic mechanism.

a) If the valve is closed, eliminate defects in the alarm

b) If the valve is open, close it manually. To do so, proceed as follows:

- 1) close air pipe line valve 39;
- 2) turn the handle of control valve 40 to the OPEN position; pressure from the cavity of the pneumatic mechanism will be released and then return the handle to the CLOSED position;

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3) fit the ratchet wrench on pneumatic mechanism shaft 118 and close valve 1-1;

4) remove the ratchet wrench and put it in due place.

39. Make locking clamp 1-1 get engaged with the hydraulic mechanism.

C. MAINTENANCE OF AIR INDUCTION SYSTEM

When It Is Not Used for Long Period of Time

The air induction system may not be used for a long period of time during scheduled and medium repairs of the submarine.

40. Inspect the air induction system except for the disassembled units as specified in Section E of this book.

D. TROUBLES AND REMEDIES

No.	Trouble	Cause	Remedy
41	Penetration of water through drain pipe lines 8 and 9	a) Damaged packing rings 52 of flaps 3 and 10 b) Maladjusted drives 6 and 13	a) Replace packing rings 52 b) Adjust the drives by means of turnbuckles 74 and by changing the length of lever 76 by shifting clamp 77
42	Oil leakage from cylinders of hydraulic mechanisms	a) Damaged collars 66 b) Loose cylinder covers	a) Replace collars 66 b) Tighten the cylinder covers
43	Water leakage through seal of hydraulic mechanism	Damaged packing rings 59	In the surface condition replace packing rings 59, in the submerged condition tighten gland 60

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Nos	Trouble	Cause	Remedy
44	No lubricant supply through lubrication pipe line	a) Damaged pipes b) Clogged pipes c) Solidified lubricant in winter	a) Replace damaged pipes b) Burn the pipes through c) Warm the pipe line with steam
45	Air leakage through pneumatic mechanism cylinders 96	a) Damaged packing rings 106 and 112 b) Loose cylinder covers 111	a) Replace packing rings 106 and 112 b) Tighten cylinder covers 111
46	Oil leakage from cataract of hydraulic mechanism 96	a) Damaged packing rings 108 b) Screwed out plugs 116	a) Replace packing rings 108 b) Screw in plugs 116 and lock them
47	Poor sealing of inboard valves 4 and 14	Maladjusted crank gear of valves and pneumatic mechanisms	Adjust close fitting of packing ring 86 of valves 4 and 14 to seating coaming with turnbuckle 93

E. PREVENTIVE MAINTENANCE INSPECTIONS AND REPAIRS

Daily Inspections

48. Inspect externally all the mechanisms and fasteners.
49. Open and close flaps 3 and 10, inboard valves 4 and 14 and all other valves relating to the air induction system.
50. Check the functioning of the alarm system against the readings of the indicators for closed and open positions of flaps 3 and 10 and inboard valves 4 and 14.

Weekly Inspections

Perform all the operations of the daily inspection and in addition to that do the following:

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51. Lubricate the drives and the flaps through the lubrication system.

52. Check the amount of grease in the plunger-type lubricators and, if necessary, fill them with lubricant. Prior to filling the plunger-type lubricators with lubricant open vent valves 44 (See Fig. 8). After filling the lubricators with lubricant close the valves.

53. Check the amount of lubricant under sail cloth 73 of drives 6 and 13 and, if necessary, add some lubricant.

54. Lubricate hydraulic mechanisms 5.

55. Lubricate rods 87 of inboard valves 4 and 14 by means of grease fittings through pipe 90 and the inserts of links 92 and 94 by means of a grease gun.

56. Add grease to shaft 118 of pneumatic mechanism 96.

Monthly Inspections

Perform all the operations of the weekly inspection and in addition to that do the following:

57. Check the adjustment of flap drives 6 and 13 and the crank gear of valves 4 and 14; check the operation time of the flaps and inboard valves (for the flaps - 2 - 3 sec. and for the inboard valves - 3 - 4 sec.), minimum pressure in the hydraulic (about 72 kgf/cm²) and pneumatic (about 28 kgf/cm²) systems at which the valves and flaps should open and close.

58. Tighten the flange connections.

Note: When the submarine is at sea, operations under Items 48, 49, 53, 57 and 58 are performed, if possible.

Three-Month Inspections

Perform all the operations of the monthly inspection and in addition to that do the following:

59. Check the packing rings of the pneumatic mechanisms and the cups of the hydraulic mechanisms; if necessary, replace them.

60. Check the condition of the rubber packing rings of flaps 3, 10 and 86 and inboard valves 4 and 14.

61. Tighten the glands of flaps 3 and 10 and, if necessary, replace them.

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62. Check the condition of the plunger and packing rings of hydraulic mechanisms 5 and, if necessary, replace them.

Six-Month Inspection

Perform all the operations of the three-month inspection and in addition to that do the following:

63. Check the pipe line of the lubrication system for unobstructed lubricant supply by disconnecting the pipe unions in turn from the grease fittings and by operating the plunger-type lubricators. Burn the clogged pipes through.

64. Remove plugs 116 on rack 109 and check the pneumatic mechanism for proper lubrication and cavity I for filling with lubricant. Remove cover 120 together with the lock (See Fig.13) to check cavity II for packing with grease, grade AMC-1, with graphite and cavity E for packing with grease, grade AMC-1, up to the axis of teeth of rack 109.

65. Fill cavities B of the inboard valve with grease (See Fig.12).

66. Overhaul, clean and lubricate the flap drives. After the overhaul adjust drives 6 and 13 in the following way:

a) Manually adjust the overstepping of the top and bottom dead centers by hydraulic mechanism crankshaft 65 equal to 10 mm.

b) Adjust the sealing of the vertical coaming. To do so, proceed as follows:

1) Manually set the hydraulic mechanism in the CLOSED position.

2) Changing the length of the drive tie-rod with turnbuckle 74 press flap disc 53 to the vertical coaming, obtain uniform fitting of packing ring 52 throughout its whole perimeter. After that, lock the coupling of turnbuckle 74 with nuts and lock washers.

c) Adjust the sealing of the horizontal coaming in the following way:

1) Manually set the hydraulic mechanism in the OPEN position.

2) Changing the length of lever 78 by shifting clamp 77 obtain uniform fitting of packing ring 49 of disc 50 to the horizontal coaming and fix the clamp with nuts and lock washers.

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d) The adjustment of both coamings is considered over if the overstepping of the dead centers by the hydraulic mechanism is accomplished with considerable effort applied to the ratchet wrench by one person.

CAUTION! During adjustment of the drives the hydraulic system should be disconnected.

e) After the adjustment:

- 1) Check the flap for tightness when the vertical coaming is closed.
- 2) Check the minimum pressure in the hydraulic system at which the flap operates.
- 3) Check the time necessary to open and close the flap at maximum pressure in the hydraulic system.

Note: The adjustment of the drives is also required in case of poor tightness of the flaps and after the replacement of the packing rings.

Scheduled Maintenance

During scheduled maintenance of the submarine perform all the operations of the six-month inspection and in addition to that do the following:

67. Overhaul valves 17 and 39 and check their tightness.

-valve 15 at a pressure of 38 kgf/cm² (with hydraulic fluid).

-valve 39 with a pressure of 35 kgf/cm² (with air).

68. Overhaul flaps 3 and 10 and inboard valves 4 and 14.

69. Test the watertight sections of pipe lines 2 and 11 with an internal hydraulic pressure of 38 kgf/cm². In this case inboard valves 4 and 14 should be closed, outboard flaps 3 and 10 should be disconnected and flanges A and B should be plugged (see Fig. 1). After that, connect outboard flaps 3 and 10 to the pipe lines and test them together with the snorkel induction flap for tightness with an internal air pressure of 0.2 kg/cm². For this test close the outboard coat flange joints A and B with soap suds. Air leakage from the flaps is permissible. Tight pipe line 7 by flooding with water.

70. As soon as the test is completed, return the air induction system to the initial position.

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d) The adjustment of both coamings is considered over if the overstepping of the dead centers by the hydraulic mechanism is accomplished with considerable effort applied to the ratchet wrench by one person.

CAUTION! During adjustment of the drives the hydraulic system should be disconnected.

e) After the adjustment:

- 1) Check the flap for tightness when the vertical coaming is closed.
- 2) Check the minimum pressure in the hydraulic system at which the flap operates.
- 3) Check the time necessary to open and close the flap at maximum pressure in the hydraulic system.

Note: The adjustment of the drives is also required in case of poor tightness of the flaps and after the replacement of the packing rings.

Scheduled Maintenance

During scheduled maintenance of the submarine perform all the operations of the six-month inspection and in addition to that do the following:

67. Overhaul valves 15 and 39 and check their tightness:

- valve 15 at a pressure of 38 kgf/cm² (with hydraulic fluid),
- valve 39 with a pressure of 35 kgf/cm² (with air).

68. Overhaul flaps 3 and 10 and inboard valves 4 and 14.

69. Test the watertight sections of pipe lines 2 and 11 with an internal hydraulic pressure of 38 kgf/cm². In this case inboard valves 4 and 14 should be closed, outboard flaps 3 and 10 should be disconnected and flanges A and B should be plugged (See Fig.1). After that, connect outboard flaps 3 and 10 to the pipe lines and test them together with the snorkel induction flap for tightness with an internal air pressure of 0.2 kgf/cm². For this test, close the flaps and coat flange joints A and B with soap suds. Air leakage through the flaps is permissible. Test light pipe line 7 by flooding with water.

70. As soon as the test is over, set the air induction system in the initial position.

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F. REFERENCE DATA

1. The service life of the moulded rubber parts (packing rings for the outboard flaps, inboard valves, pneumatic and hydraulic mechanisms) is 1 year. The total life of the above-mentioned parts should not exceed 7 years including the service life and the storage period.
2. Description and Maintenance Instructions for Diesel Engines and Diesel-Compressors .
3. Description and Maintenance Instructions for Snorkel System.
4. Description and Maintenance Instructions for Starting Pipe Line of Main Diesel Engines, Diesel-Compressors MK-2 and Control Pipe Line of Pneumatic Clutches.
5. Description and Maintenance Instructions for Ship's Ventilation Supply and Exhaust Systems.
6. Description and Maintenance Instructions for Hydraulic System.

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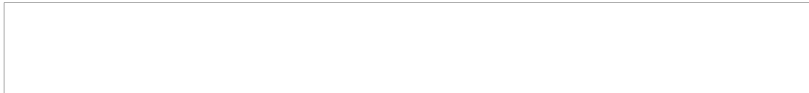
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